

CORRES. CONTROL

LTR. NO.

K-H Corres. #

Originator Ltr Log #

SLG-003-97

97 - RF -

DIST.	LTR	ENC
BARTHEL, J.M.		
BENGEL, P.R.		
BENSON, C.A.		
CARMEAN, C.H.		
DAWSON, D.		
EDWARDS, J.D.		
FINDLEY, M.E.		
FITZ, R.C.		
GUINN, L.A.		
HUGHES, F.P.		
MCANALLY, J.L.		
POWER, A.P.		
REED, A.B.		
TYSON, A.M.		
WAGNER, M.J.		
WHEELER, M.		

Broussard, M X
 Salomon, H X X
 Valenzuela, F X X

RMRS RECORDS	X	X
RF CORRES. CONTROL		
TRAFFIC		
PATS/T130G		

CLASSIFICATION:

UCNI		
UNCLASSIFIED		
CONFIDENTIAL		
SECRET		

AUTHORIZED CLASSIFIER
SIGNATURE:

Date:

IN REPLY TO RF CC NO.:

ACTION ITEM STATUS:

☐ PARTIAL/OPEN☐ CLOSED

LTR APPROVALS:

MCB: MCB
 ORIG. & TYPIST INITIALS:
 HS/AW

RF-46469(Rev. 1/97)



Rocky Mountain
Remediation Services, L.L.C.
... protecting the environment

Flats Environmental Technology Site

x 464

Colorado 80402-0464

(303) 966-7000

July 24, 1997

Laurie Beitel

Lockheed Martin Idaho Technologies Company

P.O. Box 1625

Idaho Falls ID 83415-8102

TRANSMITTAL OF REVISED L-0435.12 AND SUPPORTING INFORMATION FOR ROCKY FLATS GRANULAR ACTIVATED CARBON - SLG-003-97

Attached please find a replacement of the first page of the L-0435.12 form which contains a modification to the waste profile for Granular Activated Carbon (GAC). The modification was made as a result of a comment received from Idaho National Engineering and Environmental Laboratory (INEEL) staff concerning the presence of Pu-241 in the GAC waste stream. Upon further review and consultation with health physics staff, Pu-241 was determined to be present in the GAC at levels requiring reporting under INEEL Reusable Property, Recyclable Materials, and Waste Acceptance Criteria. As such, the appropriate page of the waste profile form is being submitted to replace the corresponding page transmitted to you on July 17, 1997.

Supporting calculations and documentation are also being included for your files. This includes: a calculation of Pu-241 activity from Pu-239 activity, a reference page and table listing the mass composition of Rocky Flats plutonium, and a copy of an E-mail note from health physics personnel justifying the rationale for calculating Pu-241 from its mass ratio in typical Rocky Flats plutonium.

It is believed that upon satisfactory resolution of the Pu-241 comment, the waste profile for Rocky Flats GAC will be approved. It is assumed that this transmittal will resolve the comment. If you have any questions please call me at (303) 966-6588 or Hopi Salomon at (303) 966-6627.

Shaun L. Garner

Shaun L. Garner
Project Manager

HS/aw

cc: John D. Harris, LMITCO



MATERIAL AND WASTE CHARACTERIZATION RADIOLOGICAL CHARACTERISTICS OF MATERIAL

FORM L-0435.12#
(07-96 - Rev. #00)

Characterization Identification No.: _____

C. Characterization of Material

3. Radiological Characteristics of Material:

- a. For MLLW and MTRU give (check one) ☐ Known or ☒ Estimated date of initial generation: at or before October 1964
- b. ☐ Yes ☒ No Is waste treatment plan for MLLW on file with INEL MLLW coordinator?
- c. ☒ Yes ☐ No Is fissile material present? If yes, waste matrix group _____ (RWMC Acceptance Only)
- d. ☒ Yes ☐ No Are transuranic isotopes present? If yes, complete items 3e, 3f, and 3h.
- e. Total activity per gram of waste of alpha emitting transuranic isotopes with half-lives greater than 20 years:
- ☒ Yes ☐ No ≤ 10 nCi/g (LLW) or
- ☐ Yes ☒ No > 10 nCi/g and ≤ 100 nCi/g, (SCW), or
- ☐ Yes ☒ No > 100 nCi/g (TRU)

f. Transuranic isotope inventory:

Isotope	Activity Range		Fissionable Material Range		Representative Sample Analysis	
	Units	(pCi/g)	g / kg		Activity (nCi/g)	Fissionable Material g / kg
Pu-239/240	0.013+/- 0.005	to 0.376+/- 0.034	1.29E-10	to 6.59E-09		
Am-241	0.004+/- 0.004	to 0.382+/- 0.050	0	to 1.26E-10		
Pu-241	0.0168	to 0.86	1.63E-13	to 8.35E-12		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
		to		to		
Summation:	0.017	to 0.758	1.29E-10	to 6.72E-09		

- g. ☒ Yes ☐ No Is U-233 or U-235 present? If yes, complete data below and item 3h.

Isotope	Activity Range		Fissionable Material Range		Representative Sample Analysis	
	Units	(pCi/g)	g / kg		Activity (Ci/g)	Fissionable Material g / kg
U-233		to		to		
	enriched to	%				
U-235	0.013+/- 0.013	to 0.240+/- 0.032	0	to 1.26E-04		
	enriched to	0 %				

- h. Fissionable material range summation: 1.29E-10 to 1.26E-04 (grams)

ENGINEERING/SCIENTIFIC NOTE PAD



Rocky Mountain
Remediation Services, L.L.C.
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SUBJECT:

Calculation of Pu^{241} Activity from Pu^{239} sample results from GAC

Project No: GAC

Prepared By: Hapi Solomon, MK

Client: RMRS → INEEL GAC

Reviewed By: Stephen Bant, RMRS

Sheet: 1 of 1

Date: 7/18/97

Pu^{239} concentration from L-0435.12 (SAMPLE RESULTS FROM PRESENT DAY)

Low 0.013 ± 0.005 pCi/g ≈ 0.008 pCi/g

high 0.376 ± 0.034 pCi/g ≈ 0.41 pCi/g

Assume Pu^{239} concentration from today is same as original (33 year old) because half life is very long.

Determine mass ratio of original Pu^{241} to Pu^{239} in Rocky Flat weapons grade Pu

Reference: Plutonium Isotopic Ratios @ Rocky Flats

by P.W. Krey (HASL), B.T. Krajewski (HASL), 1972

TABLE 1, p I-71, MASS COMPOSITION OF ROCKY FLATS PLUTONIUM.

From TABLE

$Pu^{239} = 93.34 \pm 0.5$ % by weight mass

$Pu^{241} = 0.58$ % by weight mass

$$\text{Therefore, ratio of } Pu^{241} : Pu^{239} = \frac{0.58}{93.34} \times 100 = 0.621\% = 0.00621$$

CALCULATION OF ORIGINAL (NOT decayed to present) Pu^{241}

Low range 0.008 pCi/g Pu^{239}

high range 0.41 pCi/g Pu^{239}

Specific Activity of $Pu^{239} = 2.3 E-3$ TBq/g
 $Pu^{241} = 3.81$ TBq/g

Ref: The Health Physics and Radiological Health Handbook
Bernard Selikien p 285 1992

$\frac{Pu^{239} \text{ activity}}{Pu^{241} : Pu^{239} \text{ mass ratio}} = \frac{\text{specific activity}}{\text{ratio } Pu^{241} : Pu^{239}}$

$$\text{Low Range} = 0.008 \text{ pCi/g} \times 0.00621 \times \frac{3.81}{2.3 E-3} = 8.23 E-2 \text{ pCi/g } Pu^{241}$$

$$\text{high range} = 0.41 \text{ pCi/g} \times 0.00621 \times \frac{3.81}{2.3 E-3} = 4.22 \text{ pCi/g } Pu^{241}$$

Decay to Present Day:

USE RADDECAY From Jerry Andersons computer. Assume 33 year old Pu.

$$\text{Low Range} = 1.68 E-2 \text{ pCi/g } Pu^{241}$$

$$\text{High Range} = 0.86 \text{ pCi/g } Pu^{241} \quad (\text{NOTE } Am^{241} \text{ (calculated)} \approx 0.108 \text{ pCi/g } Am^{241})$$

All other isotopes are below INEEL RRWAC reporting criteria.

PLUTONIUM ISOTOPIC RATIOS AT ROCKY FLATS

by P. W. Krey (HASL)
B. T. Krajewski (HASL)

ABSTRACT

Mass spectroscopic analysis of plutonium recovered from soil around Rocky Flats permits the quantification of low levels of plant plutonium superimposed on plutonium from global fallout. At 18 and 32 km east of Rocky Flats, plant plutonium is present at 0.89 and 0.15 mCi/km² deposition concentrations which are 60 and 10 percent of the global value, respectively. A new method of inventorying was developed which essentially reproduced an earlier inventory within the 3 mCi/km² contour but which reduced the burden beyond this contour to $\frac{1}{2}$ the earlier estimate.

The Dow Chemical Company's Rocky Flats plant processes plutonium for nuclear weapons under contract to the Atomic Energy Commission. After it had been discovered that a release of plutonium to the environs had occurred (1), a limited soil collection and analysis program broadly described the distribution and extent of the contamination (2).

The soil collection sites and the deposition contours of plutonium from the previous study (2) are reproduced in Figures 1 and 2. It was concluded from the contours that

Table 1

Mass Composition of Rocky Flats Plutonium

<u>Isotope</u>	<u>Half Life</u> (years)	<u>% by Weight</u>	<u>Ratio to Pu-239</u>
Pu-233	89	0.04 ± 0.01 0.01 (a)	$0.0004 \pm 25\%$ 0.0001 (a)
Pu-239	24,360	93.34 ± 0.5	1.0
Pu-240	6,760	6 ± 0.5	$0.06 \pm 10\%$
Pu-241	13	0.58	0.0062
Pu-242	379,000	0.04	0.0004

(a) Data from reference (4)

Author: Jerry Anderson at mail9

Date: 7/23/97 3:46 PM

Priority: Normal

TO: Hopi Salomon at Hotel17

Subject: Calculation of Pu-241

----- Message Contents -----

There are two ways that we could use to calculate the Pu-241 in the GAC. One would be to use RADDECAY to calculate the amount from the Am-241 value that we have for the waste. This number would probably overestimate the Pu-241 value due to the separation process involved in purifying weapons grade Pu. Am-241 is concentrated during this process, and can be found in some Rocky Flats waste completely separated from Pu waste. Therefor, back calculating Pu-241 from Am-241 could overestimate the Pu-241 concentrations.

The other method, the one you used, would be to use the Site specific technical documents that give the percent abundance of Pu-241 in Rocky Flats plutonium. This would give a much better, accurate estimate of the Pu-241 concentration.

Let me know if you have any more questions.

Jerry Anderson
Senior Health Physicist, RMRS